IEEE Transactions on Applied Superconductivity 2016 vol.26 N3

A Proximity Effect in Pure HTS/Ferromagnet Contacts

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Abstract

Â© 2016 IEEE.The proximity effect is theoretically studied for thin and massive pure ferromagnet/higherature superconductor (F/HTS) contacts. It is shown that there is no continuous matching between the s-wave and d-wave pair amplitudes at the HTS/F boundary. In thin HTS/F nanostructures, the exchange field strongly suppresses the averaged s-and d-pairing and leads to the competition between BCS and FFLO scenarios of superconductivity. On the contrary, in massive HTS/F contact, the exchange field has no effect on the critical temperature Tcd of d-wave pairing. This is due to the lack of d-wave pairing in F layers, resulting in full internal reflection of d-wave pairs even from the perfectly transparent HTS/F boundary. The s-wave superconductivity localized at the HTS/F interface is predicted.Spontaneous symmetry change of the order parameter at the HTS/F interfaces from initially d-wave type to s-type becomes possible for massive HTS/F contact. It qualitatively agrees with experimental observations of the mixture of s-and d-wave components at the Ag/BiSrCaCuO and Fe/Ag/BiSrCaCuO interfaces.

http://dx.doi.org/10.1109/TASC.2016.2529286

Keywords

Magnetism, multilayers, proximity effect, superconducting transition temperature, Superconductivity